JAPANESE [JP,2001-337033,A]

Drawing selection Representative draw

[Translation done.]

ID=000002

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention measures the internal distribution of dispersion absorption of analyte about a light measuring device using light, It is applicable to medical fields which measure aging of the blood flow of each part of the inside of a brain, and change of oxygen supply about the device which diagnoses the normality of an organization, and abnormalities from the change with time of a living body's ingredient, such as an oxygen monitor and a circulatory system fault diagnostic.
[0002]
[Description of the Prior Art]Hemoglobin has played the role which carries oxygen by combining with oxygen in blood or separating. Since the hemoglobin contained in blood is fluctuated according to extension and contraction of a blood vessel, detecting extension and contraction of a blood vessel is known by measuring the quantity of hemoglobin under this organization. The somatometry which measures the inside of a living body by non-invasion simple using light is known using the concentration of hemoglobin corresponding to the oxygen metabolism inside a

living body. The concentration of hemoglobin irradiates a living body with the light of the wavelength of a near infrared region from visible light, and is calculated from the amount of absorption of light produced by penetrating a living body.

[0003]Within a brain, even if oxygen is used by the brain activity, usually oxygen supply more than an initial complement is performed in the part currently activated by blood-flow reallocation operation, and the quantity of oxyhemoglobin is increasing the part activated as a result to it. Therefore, measurement of a motion of oxyhemoglobin and a deoxyhemoglobin is applicable to observation of cerebral activity. Generally the shape differs by whether hemoglobin combines with oxygen and the absorption spectrum of hemoglobin serves as oxyhemoglobin, or oxygen separates and it becomes a deoxyhemoglobin. Non-invasion fixed-quantity measurement of oxyhemoglobin and a deoxyhemoglobin is developed using the difference in the shape of this spectrum.

[0004]Thus, by the light measuring device's being able to measure the activated state of a cerebral blood volume change or an oxygen metabolic turnover, being able to apply it to measurement of cerebral functions, such as movement, feeling, and thinking, etc., and displaying a measuring result as a picture, The application effect to medical fields, such as cerebral function diagnosis of a living body and a circulatory system fault diagnostic, can be heightened. The light measuring device can perform two or more measurement on analyte by composition provided with two or more light transmission points which irradiate analyte, and points which receive the light emitted from analyte receiving light, respectively. Change of the point of measurement on analyte and the depth direction of data obtained can be changed by changing the position and combination of a light transmission point and the point receiving light.

[0005]In the light measuring device provided with such two or more light transmission points and points receiving light, the following methods are conventionally known as composition which changes the position and/or combination of a light transmission point and the point receiving light. In one method, as shown in drawing 9, as for plurality, a light transmission point (light transmission point a-e) receives, it has one light source, analyte is irradiated from one light transmission point at the time of 1 measurement, and there is a method which records the signal of the required point receiving light one by one, and goes by changing connection between a light source and a light transmission point one by one. Since the signal by the light (dispersion and catoptric light) irradiated from other light transmission points since light was not simultaneously irradiated from two or more light transmission points does not mix according to this, interference of a measurement signal can be

prevented.
[0006]It has several light sources in which lighting frequency differs to two or more emitter parts, and what irradiates analyte with the light from which frequency differs from the same emitter part is known for other methods. In this composition, amplifying by the lock in amplifier which aligns with the frequency of a light source from the inside of the lightwave signal which received light, respectively separates an object signal ingredient. The composition which combined the narrow-band tuned circuit by the same frequency as the frequency of a light source which aligns and carries out signal amplification, and the synchronous rectification circuit detected synchronously as composition which holds the method by a lock in amplifier is known. Even if it puts on which above-mentioned method, the measurement data obtained by a measuring part to the group of a light transmission point and the point receiving light is made to correspond fixed by each channel of the Records Department. In the alternative form especially by a lock in amplifier, since it is necessary to have and put the lock in amplifier according to the combination of a light transmission point and the point receiving light on a primary detecting element for hard wiring by connection, the group and signal record channel of a light transmission point and the point receiving light do not obtain a fixed fake colander increasingly.
[0007]
[Problem(s) to be Solved by the Invention]in the all directions type considered conventionally as mentioned above, the light source and the transmission-and-reception light spot are being fixed, and an operator performs these setting out and changes -- as -- it is not made. It was impossible to have extended a measuring point, without there being a problem of requiring many light sources and detectors according to the increase in the number of the point of measurement, and increasing the number of a light source or detectors. Then, in [this invention solves the above mentioned conventional problem, and] measurement of two or more parts of analyte, The position and combination of a light transmission point and/or the point receiving light which operate simultaneously, without changing setting out of a light source and a transmission-and-reception light spot, and connection of wiring, It sets it as the 2nd purpose to enable the increase in the number of the point of measurement to an analyte top, without setting it as the 1st purpose that an operator can set up and choose it as a suitable combination according to the measurement purpose free, and increasing the number of a light source or a detector.
[0008]
[Means for Solving the Problem]Combination of the 1st mode using a conversion table method with which this invention connects combination and a record channel of a light transmission point and a point receiving light by a conversion table, the 2nd

mode using a branching transparent material, a light transmission point, and a point receiving light, and a conversion table method of a record channel, It has the 3rd mode that combines ** for a branching transparent material. Change of combination of a light transmission point of operating simultaneously in measurement of two or more parts of analyte by this, or a point receiving light, Setting out for a short time is attained by choosing a conversion table used out of the above-mentioned conversion table of a large number which an operator enabled setting out of free, without changing setting out of a light source and a transmission-and-reception light spot, and connection of wiring, and were set up beforehand. When using a branching transparent material furthermore, an increase in the number of the point of measurement to an analyte top is attained without increasing the number of a light source or a detector.

[0009]In the 1st mode, the feature is that it prepared a conversion table which matches a group of a light source and a detector, or a group of a light transmission point and a point receiving light with a record channel prepared independently. This record channel is a signal path which sends measurement data to an indicator, and has achieved a function of relay for delivering measurement data obtained for every combination of a light source and a detector, or combination of a light transmission point and a point receiving light to image display in which it was provided in the latter part, or an indicator which carries out graphical representation. Although the number of record channels is made into a placing [prepare only a number required for imaging enough and]-from No. 1 to No. N-it thing, there is no necessity of making it in agreement with a light source and the number of combination of a detector, and from the number of each of a light source and a detector, it can prepare independently and can place.

[0010]Hard structure which decides how to process a signal acquired between a light source and a detector or from between a light transmission point and a point receiving light by using a relay function of a record channel introduced here is made unnecessary. In a record channel, setting out or a change of combination of a light source, a detector or a light transmission point, and a point receiving light, Since a conversion table set up on software can perform, setting out and change are attained only by rewriting software, and flexibility of measurement can be raised easily. If beam branch conductors, such as a branching fiber, are furthermore combined with a conversion table, an increase in the number of the point of measurement to an analyte top will become easy.

[0011]In a light measuring device which measures light emitted outside after composition of the 1st mode of this invention irradiates analyte and penetrates and/or reflects inside of analyte from two or more light transmission points at two or more points

receiving light, One or more light sources which send light to a light transmission point, and one or more detectors which detect light of a point receiving light, two or more sets formed by one point in one light transmission point in two or more light transmission points, and two or more points receiving light receiving light or one light source, and one detector -- seeing -- each measurement data obtained, It has composition provided with a conversion table to which a record channel relayed for transmitting to a latter treating part which performs image processing etc. is made to correspond. This conversion table can be set up on software, and one light transmission point and one point receiving light construct it, or it assigns **** of one light source and one detector to each record channel. An operator can set up this conversion table using an operation screen. It becomes easy to perform optical measurement between different transmission-and-reception light spots in some numbers by choosing and measuring one from a conversion table of a large number set up beforehand.

[0012]A branching transparent material is used for the 2nd mode as a transparent material which sends light from a light source to a light transmission point, and a transparent material which leads light which received light at a point receiving light to a detector. This branching transparent material branches an end of one transparent material to plurality, constitutes a branching tip, and establishes this branching tip in two or more light transmission point or two or more points receiving light on analyte. By this composition, two or more light transmission to an analyte top and light-receiving from two or more places of analyte are performed simultaneously, an increase in the number of the point of measurement to an analyte top presupposes that it is easy, and measuring time in measurement of two or more parts of analyte is shortened. In a light measuring device which measures light emitted outside after composition of the 2nd mode of this invention irradiates analyte and penetrates and/or reflects inside of analyte from two or more light transmission points at two or more points receiving light, One or more light sources which send light to a light transmission point, and one or more detectors which detect light of a point receiving light, Light from at least one of the branching transparent materials for light transmission which branches at two or more light transmission points on analyte from one light source, and sends light, or two or more points on analyte receiving light is considered as at least one composition of a branching transparent material for light-receiving led to one detector provided with either at least.

[0013]In the above-mentioned composition, optical measurement between transmission-and-reception light spots corresponding to each channel is performed by separating and measuring light obtained from the same branching transparent material. An end of

a transparent material can be branched and the number of a light transmission point or a point receiving light can be made to increase to a number of a transparent material by making this branching tip into two or more light transmission points or a point receiving light. A measuring region of analyte is divided into a region division which does not receive interference of light mutually, and each branching transparent material is considered as composition provided with an end which branches from the same branching transparent material in [at most one] a region division. If this characteristic that analytes, such as a living body, are strong scatterers, about 1/of that lightwave signal will be set to 10 if distance from a light transmission point separates 10 mm, and is set to 1000 about 1/at about 1 / 100 or 30 mm by 20 mm is used, In two or more light transmission point arrangement, when separated [beyond distance with between / constant / light transmission points], even if it carries out light transmission simultaneously, a grade of mutual interference becomes low.

[0014]In a measuring region of analyte, it dissociates to such an extent that interference of light is not received mutually, and a field is divided, and a channel is formed with a light source and a detector or a light transmission point, and a point receiving light which were established in this region division. And when it is referred to as at most one in this region division and two or more ends which branch from the same branching transparent material do not provide in the same region division, a branching tip established in a branching transparent material separates light transmission to analyte, and light-receiving from analyte, and is performed.

[0015]The 3rd mode is the composition which combined the 1st mode and 2nd mode, and is composition provided with a light source, a conversion table method which makes combination of a detector correspond to a record channel, and a branching transparent material. In a light measuring device which measures light emitted outside after composition of the 3rd mode of this invention irradiates analyte and penetrates and/or reflects inside of analyte from two or more light transmission points at two or more points receiving light, A light transmission point is equipped with one or more light sources which send light, and one or more detectors which detect light of a point receiving light, at least one of the branching transparent materials for light-receiving which lead light from two or more points on at least one or analyte of a branching transparent material for light transmission which branches at two or more light transmission points on analyte from one light source, and sends light receiving light to one detector -- it has either at least.

[0016]Under the present circumstances, although a lightwave signal may be made simultaneous at the both-sides side of a branching tip of a branched transparent material as for light

transmission and light-receiving, a record channel can be made to be able to respond and combination of transmission-and-reception light can be set up so that measurement data may not lap mutually by said conversion table. A conversion table constructed beforehand is set up, and if optical measurement between transmission-and-reception light spots set up by a conversion table which chose and chose one conversion table from two or more of these conversion tables is performed, only a branched number can increase the number of light transmission or points receiving light. [two or more]

[0017]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described in detail, referring to a figure. First, the 1st gestalt that used the conversion table to the record channel is explained using drawing 1. Drawing 1 is a schematic diagram showing the system of whole this invention. In the example to illustrate, it has the five light sources 2 of a-e, and the four detectors 5 of A-D, and asks for measurement data by the measuring part 8 based on the detecting signal of the detector 5, the measurement data beforehand defined out of measurement data through the record channel is sent to an indicator, and display processing, such as image display and graphical representation, is performed. In the light transmission point 3 and the point 4 receiving light on the analyte 10, light transmission of the light is carried out to the light transmission point 3 from the light source 2, and the detector 5 detects the light which were scattered about in the inside of the analyte 10 and was emitted from the point 4 receiving light. Between the light source 2 and the light transmission points 3 and as for between the point 4 receiving light and the detectors 5, transparent materials, such as an optical fiber, are arranged. In drawing 1, the light transmission point 3 gives and shows a slash, and shows the point 4 receiving light in white.

[0018]The light source 2 can be considered as the composition provided with two or more light emitting devices corresponding to each light transmission point 3, or the composition which switches the light from one or more light emitting devices to each light transmission point 3. It can have composition provided with two or more sensing elements also about the detector 5 corresponding to each point 4 receiving light, or composition which switches one or more sensing elements to each point 4 receiving light. The control section 7 controls the emission operating of the light source 2, the detecting operation of the detector 5, the measuring process of the measuring part 8, transmission of the measurement data based on a record channel, display processing of the indicator 10, etc. The control section 7 controls the measuring circuit included in a light source, a detector, and a measuring part, and the light source 2 (a-e) or the

light transmission point 3 and the detector 5 (A-D), or 20 sets of all the data based on the combination of the point 4 receiving light are prepared for the measuring part 8 by this.

[0019]As opposed to the record channel 9 (the example to illustrate record channel of the channel 1 to the channel 16) with which the 1st gestalt of this invention continues after the measuring part 8, The measurement data (the example to illustrate 20 sorts of measurement data) of all the kinds acquired by the measuring part 8 is made to correspond, and it is characterized by the point provided with the conversion table which defines this correspondence relation. The correspondence relation which determines whether this conversion table transmits the measurement data of the measurement data (example to illustrate 20 sorts of measurement data) throat of all the kinds acquired in the combination of the light source 2 and the detector 5 to the following indicator 8 through the record channel 9 is made into a table. 20 sorts of measurement data are given to the group of the light source 2, the detector 5 or the light transmission point 3, and the point 4 receiving light, and corresponds to the measured region between the light transmission point 3 and the point 4 receiving light on the analyte 10 so that it may see by a-A, a-B, b-A, etc.

[0020]In the example of drawing 1, although 12 of 20 sets of measurement data of a measuring part are matched with the record channel 9, the eight [remaining] is not connected with a record channel. That is, although eight data is created by the measuring part 8, it shows that it is discarded without being used actually. An operator chooses or or the selection of whether to discard which actually uses measurement data in consideration of the combination of the light transmission point arranged in analyte, and the point receiving light. In the example of drawing 1, when a transmission-and-reception light spot becomes the combination which adjoined each other mutually, a-A, a-B, b-A, etc. connect the measurement data to the record channel 9, and remove a separated combination from selection like a-C, a-D, b-B, and b-C. This is because judgment of removing from the start since the light detected is expected that are weak and there are many noises in the combination which separated is taken in.

[0021]Thus, the method of using the conversion table which makes the combination (or a light transmission point and the point receiving light should put together) of the light source and detector obtained by the measuring part 8 correspond to the record channel 9 is effective at the point which can perform selection of of which measured part for the signal of which measured region to be used by judgment of an operator, and not to use a signal. It is set up in this conversion table being prepared on the operation screen so that an operator can be set up, for example, inputting the group of a light source and detectors, such as a-A, a-B, and b-A,

into each column from No. 1 to No. 16 from a keyboard. That is, it means that it was underlined with the line of the arrow which ties the measuring part 8 and the record channel 9 of drawing 1. The number of the record channels which the total 16 of the record channel of a figure is an example, and are defined by a conversion table is not restricted to 16 channels.

[0022]Although the conversion table shown in drawing 1 is an example shown based on the correspondence relation between the light source 2 and the detector 5, this can also be called correspondence relation about the light transmission point 3 and the point 4 receiving light. The conversion table of a large number which define a different correspondence relation for every measurement purpose can also be prepared, when many conversion tables are set up in this way, a name can be named and saved at each conversion table, and a required conversion table can be chosen only by choosing the name of a conversion table. Although 12 record channels are used among 16 record channels and the remaining record channels are made intact in drawing 1, all the record channels can also be used. Generally, there are no restrictions in the number of the greatest groups of a measuring part (here 20), and the number of record channels, and even if the number of both is equal, it does not matter even if there is much one side.

[0023]This invention is considering it as the method which uses the record channel with which correspondence relations were defined by the conversion table as a function of mediation when transmitting the measurement data obtained by the measuring part to an indicator, it is not hard, is soft and performs correspondence-related selection, It is characterized by the point of having enabled it to correspond arrangement of the light transmission point and the point receiving light decided by the form of the probe which hits against analyte, and the relation of HADO ** of the test section containing a measuring part and an indicator free, and has meaning.

[0024]Next, the 2nd gestalt is explained using drawing 2 - drawing 4. In drawing 2 - drawing 4, a-c shows a light source, a1-a3 show a light transmission point, and, as for A-C, a detector, A1 - A3, B-2, and B3 show the point receiving light, respectively. On analyte, it divides and the field 1 - the field 3 are formed so that it may become a grade which the light interference between each field can disregard. When a realm name is named from [of explanation] expedient and it applies to the conversion table of the 1st above mentioned gestalt, a realm name is not necessarily indicated to a conversion table. Drawing 4 is composition measured with the light source and detector which established each region divisions 1-3 in each, and the number of the light source to need and a detector becomes three each of a region division and the same number at a time, and will require a total of

six pieces. On the other hand, according to the 2nd gestalt, the number of a light source and a detector can be reduced.

[0025]A branching transparent material is used for the light transmission to the light transmission point from a light source, and the light transmission from the point receiving light to a detector in the 2nd gestalt. A branching transparent material is the composition of having branched one end of transparent materials, such as an optical fiber, to plurality, by providing the branched end in a light transmission point or the point receiving light, performs simultaneous light transmission to two or more light transmission points, or performs simultaneous light-receiving from two or more points receiving light. A branching transparent material shall be included in a branching transparent material as an equivalent function, also when not carrying out on condition that it has branched physically, for example, leading the light from two points receiving light to one common detector with one optical fiber each (in this case, a total of 2), respectively. Light transmission may be carried out in parallel with two places with two fibers from one light source in a similar manner.

[0026]Drawing 2 (a) is the example which applied the branching transparent material to light transmission, and shows the composition which carries out light transmission of the light from the light source a to the light transmission point a1, b1, and c1 simultaneously by a branching transparent material. Analyte is divided into two or more fields 1, the field 2, and the field 3, and the light transmission point a1 and the point A receiving light, the light transmission point a2 and receiving light point B-2, the light transmission point a3, and the point C3 receiving light are formed in each field. Light transmission is simultaneously carried out to the light transmission points a1-a3 from the one light source a using a branching transparent material, and each point A1 receiving light, B-2, and the detection light of C3 are detected by each detector A-C. Since the light interference to the another province region of the light by which light transmission was carried out to each field can be disregarded, each detector A-C can detect only the light from the light transmission points a1-a3. According to this composition, the number of a light source can be reduced from three pieces to one piece.

[0027]Drawing 2 (b) is the example which applied the branching transparent material to light-receiving, and shows the composition which receives light from the point A1 receiving light, A2, and A3 with the detector A by the branching transparent material. The light transmission point a1 and the point A1 receiving light, the light transmission point b2 and the point A2 receiving light, the light transmission point c3, and receiving light point A3 are provided in each region division of analyte. Light transmission is carried out to the light transmission point a1, b2, and c3 from the light source a, b, and c through a transparent material,

respectively, and the detector A detects the detection light of each point A1 receiving light - A3. Since it can ignore, by distinguishing the time of light transmission, such as performing light transmission from the light source a, b, and c one by one, the light interference to the another province region of the light by which light transmission was carried out to each field can distinguish the light corresponding to the light transmission point a1, b2, and c3, and can detect the detector A. According to this composition, the number of a detector can be reduced from three pieces to one piece.

[0028]Drawing 3 (a) and (b) is the example which applied the branching transparent material to light transmission and light-receiving. Drawing 3 (a) carries out light transmission of the light from the light source a to the light transmission point a1 and a2 simultaneously by a branching transparent material, and shows the composition which receives light from the point B1 receiving light and B-2 with the detector B. Drawing 3 (b) carries out light transmission of the light from the light source b to the light transmission point b2 and b3 simultaneously by a branching transparent material, and shows the composition which receives light from the point A1 receiving light and A2 with the detector A. In the composition shown in drawing 3 (a), the light by which light transmission was simultaneously carried out from the light source a is detected by the point A1 receiving light and receiving light point B-2, and is measured with the detector A and the detector B. The light by which light transmission was carried out from the light source b is detected at the point B3 receiving light, and is measured with the detector B. Since the light interference to the another province region of the light by which light transmission was carried out to each field can be disregarded at this time, By distinguishing the time of light transmission, such as performing light transmission from the light sources a and b one by one, the detector A detects the light corresponding to the light transmission point a1, and the detector B can distinguish the light transmission point a2 and the light corresponding to b3, and it can detect it. According to this composition, the number of a light source can be reduced from three pieces to two pieces, and the number of a detector can be reduced from three pieces to two pieces.

[0029]In the composition shown in drawing 3 (b), the light by which light transmission was carried out from the light source a is detected at the point A1 receiving light, and is measured with the detector A. The light by which light transmission was simultaneously carried out from the light source b is detected receiving light point A2 ******** B3, and is measured with the detector A and the detector B. Since the light interference to the another province region of the light by which light transmission was carried out to each field can be disregarded at this time, By

distinguishing the time of light transmission, such as performing light transmission from the light sources a and b one by one, the detector A can distinguish and detect the light transmission point a1 and the light corresponding to b2, and the detector B can detect the light corresponding to the light transmission point b3. According to this composition, the number of a light source can be reduced from three pieces to two pieces, and the number of a detector can be reduced from three pieces to two pieces.

[0030]Next, application in the 1st gestalt of the 2nd gestalt is explained. By applying the 2nd gestalt to the 1st gestalt, the conversion table at the time of using a branching transparent material can be formed. Hereafter, the conversion table of the record channel shown in Table 1 expresses the correspondence relation between the light source in each above mentioned composition of drawing 2 (a), and a detector, and the conversion table of the record channel shown in Table 2 expresses the correspondence relation between the light source in each composition of drawing 2 (b), and a detector. Similarly, the conversion table of the record channel shown in Table 3 and Table 4 expresses the correspondence relation between the light source in each composition of drawing 3 (a) and drawing 3 (b), and a detector, respectively.

[0031]

[Table 1]

ID=000003

[0032]

[Table 2]

ID=000004

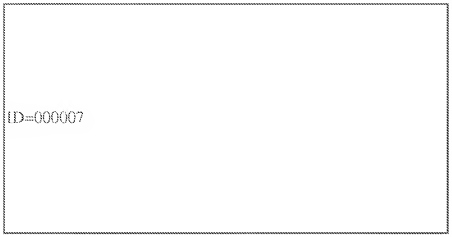
[0033]

[Table 3]

ID=000005

[0034]
[Table 4]

[0035]According to the gestalt shown above, also about the composition using a branching transparent material, the conversion table described with the 1st gestalt and the same conversion table can be used, in this example, three measured regions can be pinpointed and this can be measured using 2 sets of light sources, and a detector.
[0036]Next, other examples of the 1st gestalt are explained using drawing 5 and Table 3. Drawing 5 shows the arrangement relationship of the light source by the multichannel light measuring device of this invention and the detector, the light transmission point, and the point receiving light. In the example of composition shown here, six detectors shown by six light sources shown by a-f and A-F are arranged. The shadow area in drawing 5 shows a light transmission point, and the white portion shows the point receiving light. Generally measurement by 36 sets (6x6) of combination is possible from six light sources and six detectors at all. Although this example also explains the number of record channels as 36 channels, even if there are many channels, it is good at least. What is necessary is just to consider it as non-use about an excessive record channel. In the case of the example shown in drawing 1, the number of measurement data made from a measuring part was 20, but in this example, it becomes 36 data. The number of channels can be set up if needed from two or more prepared record channels. Required measurement data will be led to a record channel by a conversion table out of the set-up record channel. Table 5 shown below is an example of a conversion table.
[0037]
[Table 5]



[0038]In the conversion table showing in Table 5, among 36 record channels, 32 channels are set up and it has not set up about four channels. That is, four measurement data obtained by a measuring part is made setting out thrown away as non-use. Among 32 set-up record channels, the enclosure portion of the record channel 1 to the record channel 16, A light transmission point and the point receiving light adjoin, and separation is the shortest combination, and the portion which gave the underline of the record channel 17 to the record channel 32 is combination with next short separation of a light transmission point and the point receiving light. It is the combination from the record channel 33 set to "No" in which the record channel 36 has the furthest separation of a light transmission point and the point receiving light, and since sufficient signal strength to obtain a good S/N ratio is not obtained, not using it for measurement is shown. If it repeats, the above-mentioned conversion table uses combination with the shortest separation, and combination with next short separation, and shows what the operator performed setting out which makes furthest combination non-use for.

[0039]The operator itself creates many above-mentioned conversion tables beforehand for every shape of the probe with which the light transmission point and the point receiving light of the wish were arranged, and when they actually measure, they are chosen from many confrontation tables. It can also be set up switch on the light simultaneously and measure not only the measuring method that makes it turn on one light source at a time by time sharing but two or more light sources with the arrangement space of the light transmission point arranged in analyte, and the point receiving light. When the arrangement space of a light transmission point and the point receiving light is the combination which short mutual light interference cannot disregard, Each light source is driven one by one, and it measures by perfect time sharing, and about the combination which has opened to such an extent that the arrangement space of a light transmission point and the point receiving light can disregard mutual light interference, the light can be switched on

simultaneously and two or more light sources can also be measured in parallel. Thus, even when carrying out simultaneous lighting of two or more light sources, the conversion table can respond by doing the work which inputs the combination of a light source and a detector into each record channel as shown in Table 5.

[0040]Next, the 3rd gestalt that combined the 1st gestalt and 2nd gestalt is explained using drawing 6 - drawing 8, and Table 6. Drawing 6 shows the arrangement relationship of the light source by the multichannel light measuring device of this invention and the detector, the light transmission point, and the point receiving light. The example of composition shown here explains the case where four fields of the field 1 to the field 4 which analyte left for a while mutually are measured. These are suitable methods to measure the part left to such an extent that lights, such as the frontal lobe on either side and a parietal lobe on either side, did not interfere mutually using the probe using a rubber-like pad. To the pad for each fields, the three light transmission points a1, a2, ..., f1, f2, the point A1 receiving light and A2, ..., F1, and F2 have been arranged, respectively, and the light source a, b, and c, d, e, f and the detector A, B, and C, D, E, and F are connected by the branching transparent material. Here, the field in analyte is divided so that the light interference between the divided each fields can be disregarded. The shadow area in a figure shows a light transmission point, and the white portion shows the point receiving light.

[0041]Drawing 6 shows the connecting relation of a light source and a light transmission point, and the connecting relation of a detector and the point receiving light. Each field is composition which arranges a light transmission point and three points receiving light at a time, respectively. Therefore, three pieces are necessities at a time, and the composition which connects a light source and a detector respectively independent of each light transmission point and the point receiving light takes the light source and detector of every a total of 12 pieces (3x4), respectively. On the other hand, by using the branching transparent material which dichotomized, respectively to a light transmission point and the point receiving light, it can become possible to constitute from six pieces, respectively, and the number of a light source and a detector can be reduced. When using a branching transparent material unconditionally, light may interfere, but it is said below that it can arrange with devising the conversion table described until now so that light may not interfere mutually.

[0042]Although a light source and a detector open a prescribed interval into the same field and are arranged, drawing 6 (a) and (b) divides and shows the light source and the detector from the facilities of explanation. Drawing 6 (a) shows an example of the

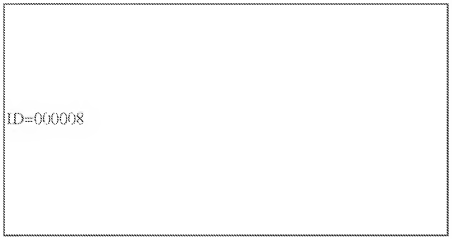
connecting relation of a light source and a light transmission point. In connection between a light source and a light transmission point, the light transmission point connected to the same light source can be made into a different field, and light transmission can be carried out to the light transmission point of two or more fields with one light source by this. For example, it connects with the light transmission point a1 of the field 1, and the light transmission point a2 of the field 2 by the dichotomous branching transparent material, and the light source a connects the light source d to the light transmission point d3 of the field 3, and the light transmission point d4 of the field 4 by the dichotomous branching transparent material.

[0043]Drawing 6 (b) shows an example of the connecting relation of a detector and the point receiving light. In connection between a detector and the point receiving light, it is considered as a different field, the point connected to the same detector receiving light changes the combination of the point which makes the same further the combination and the detector of the light transmission point which makes a light source the same receiving light, and if the same, it can be shifted so that there may be nothing. By this, even if it is a case where light transmission is simultaneously performed at two or more light transmission points, it can distinguish and detect by the detector side. For example, it connects with receiving light point A3 of the point A1 of the field 1 receiving light, and the field 3 by the dichotomous branching transparent material, and the detector A connects the detector D to the light transmission point D2 of the field 2, and the light transmission point D4 of the field 4 by the dichotomous branching transparent material. Although the branching transparent material which dichotomized by a diagram is used, the transparent material which branched to a large number, such as trifurcation and four branching, can also be used, and a light source and a detector can be reduced further in this case.

[0044]About the example of arrangement of the light source shown in drawing 6, a detector, and a light transmission point and the point receiving light, a conversion table is realizable, if it carries out as shown in the following table 6.

[0045]

[Table 6]



[0046]As arranged the light source and the detector, and the branching transparent material as shown in drawing 6 (a) and (b), and shown in Table 6, when a conversion table is defined, drawing 7 shows how measurement is performed. Drawing 7 shows the case where the light source a lights up and it measures by the detector A, B, and D and E, and supports the channels 1, 2, 3, and 4 in Table 6. Drawing 7 shows only the light source a and the detector A, B, and D, and the branching transparent material in connection with E.

[0047]For example, the channel 1 shows the combination of the light source a and the detector A, and can obtain the measurement data about the measured region between the light transmission point a1 in the field 1, and the point A1 receiving light in drawing 7 in this case. a-A is assigned to the record channel 1 in the conversion table showing in Table 6 here. Since the branching transparent material is used, to a-A, the two emitter parts a1 and a2 are possible. However, if the corresponding light sensing portion A is seen so that drawing 7 may show, correspond with the emitter part a1 which has one light sensing portion A1 in the field 1 side, and is similarly in the field 1 side, but. It does not dissociate and correspond but that there is nothing turns out [by which a lightwave signal does not come] to be the emitter part a2 which has light sensing portion A3 of another side in the field 3 side, and is in the field 2 side. Therefore, when a-A is assigned, the combination which becomes effective is only a group of a1-A.

[0048]It is assigned that light actually arrives between two possible combination so that there may be each of other groups [1 set of].Similarly, the record channel 2 shows the combination of the light source a and the detector B, and obtains the measurement data about the measured region between the light transmission point a1 in the field 1, and the point B1 receiving light. The record channel 3 shows the combination of the light source a and the detector D, Obtaining the measurement data about the measured region between the light transmission point a2 in the field 2, and the point D2 receiving light, the record channel 4

shows the combination of the light source a and the detector E, and obtains the measurement data about the measured region between the light transmission point a2 in the field 2, and the point E2 receiving light. Although receiving light point A3 connected with the detector A, the point B3 receiving light connected with the detector B at this time, the point D4 receiving light connected with the detector D and the point E4 receiving light has connected with the detector E, since the light is not switched on, a corresponding light source cannot be added to a detecting signal, can be distinguished, and can be detected.

[0049]Drawing 8 shows the case where the light source b lights up and it measures by the detector A, B, and C, D, E, and F, and supports the record channels 5-10 in Table 6. Drawing 8 shows only the branching transparent material in connection with the light source b and the detector A, B, and C, D, E, and F. For example, the record channel 5 shows the combination of the light source b and the detector A, and can obtain the measurement data about the measured region between the light transmission point b1 in the field 1, and the point A1 receiving light in this case. The record channel 6 shows the combination of the light source b and the detector B, and can obtain the measurement data about the measured region between the light transmission point b1 in the field 1, and the point B1 receiving light in this case. Similarly, the measurement data of the measured region shown with the encaustic background in drawing 8 can be obtained with the combination of each light source and a detector also about the record channels 7, 8, 9, and 10.

[0050]Although receiving light point A3 connected with the detector A, the point B3 receiving light connected with the detector B at this time, the point C3 receiving light connected with the detector C, the point D4 receiving light connected with the detector D, the point E4 receiving light connected with the detector E and the point F3 receiving light has connected with the detector F, Since the light is not switched on, a corresponding light source cannot be added to a detecting signal, can be distinguished, and can be detected. The measurement data of a measured region which corresponds similarly about other record channels is detectable.

[0051]In the combination of a light source, a detector or a light transmission point, and the point receiving light the record channel described until now, Since it has a function of the relay at the time of delivering the measurement data obtained by a measuring part to a latter indicator and it is made independent of Hurd, combination is changeable free by setting up a conversion table. That is, correspondence relations are set up in soft. Therefore, various measuring conditions, such as arrangement of an absorbance correction factor, and the light transmission point and the point receiving light to a probe (sample pad), can also be

collectively set to a record channel conversion table besides a record channel. There are no restrictions in the number of the numbers of record channels of a conversion table, and it can be arbitrarily set as it. What is necessary is to use only a required number of the numbers of record channels, and just to make the remaining record channels intact according to the combination etc. of the number, such as a light source, a detector, a light transmission point, a point receiving light, etc. which are provided in analyte, an arrangement state, the degree of a branching transparent material and an allocation state, and a transmission-and-reception light spot suitable for measurement.

[0052]A conversion table is displayed on a screen so that an operator can be operated, and since a keyboard and a mouse are operated, it is soft and it can set up on a screen, a change of a measured region can be made, without changing locating positions, such as a light source, a detector, a light transmission point, a point receiving light, and a transparent material. It is a case where locating positions, such as a light source, a detector, a light transmission point, a point receiving light, and a transparent material, differ, and can switch easily by setting up the conversion table of the record channel corresponding to each locating position.

[0053]

[Effect of the Invention]As explained above, according to the multichannel light measuring device provided with the conversion table to which the light source (or light transmission point) of this invention, the combination of a detector (or point receiving light), and a record channel are made to correspond. The conversion table of a suitable combination according to the measurement purpose can be created and chosen free, without changing setting out of a light source and a transmission-and-reception light spot, and connection of wiring for the position and combination of a light transmission point and/or the point receiving light which operate simultaneously. The number of the point of measurement to an analyte top can be increased without increasing the number of a light source or a detector.

[Translation done.]